Contribution of Behavioral Sciences to EAF or EAM

- Predict how management measures and changes in environmental and biological conditions will affect human behavior, particularly w.r.t. intensity / patterns of resource use or preferences
- Predict the economic impacts of those effects
- Design institutions (governance structures), policies and management measures that are effective and efficient

Modeling State of the Art

Improvements in Fishery Management Models

- Directional Distance Functions: Modeling bad outputs in a microlevel model of the firm
- Incorporating more spatially explicit environmental, biological and behavioral information in existing models (e.g., RUMs)

Emerging Ecosystem Models (using existing tools)

- Portfolio Theory
- Arbitrage Theory
- GEEM
- Attitudinal & Stated Preference Surveys

Modeling State of the Art

Current Salmon Ecosystem Models (Tomberlin)

- Stochastic Dynamic Programming: useful when linkage process is uncertain
- Nonlinear Integer Program:
- Mixed Integer Model: captures network effects

Modeling State of the Art

Bottom Line

- Ecosystem modeling not that different from existing models but information needs / computational burden are greater.

Food for Thought

- EAF and EAM both require broader considerations of resource dependencies and impacts,
  - which may mean more stakeholders involved.
  - Which may increase the number of objectives
  - Which may increase conflict
  - Which means that information **demands** are greater under EAF and EAM.

Ecosystem Experiences

Some observations

- Considerable variation in what has been implemented as an ecosystem management plan
- Skeptical of the degree to which behavioral models have been incorporated into scientific enterprise
- Should look at more than marine ecosystem approaches
- Should look at the process that developed the plan

Ecosystem Experiences

Some Examples:

- Forest service: optimize each sector and use this as starting point for ecosystem management (highly quantitative but not integrated)
- Thai: qualitatively evaluate all aspects of the ecosystem (holistic, integrated approach relying on expert opinion)
- HI corals, Iceland, Norway…

Data, Modeling & Data Management Requirements

Some observations

- Depends upon whether doing EAM or EAF
- Whether EAF or EAM, still need to decide objectives and criteria for prioritizing objectives
- Governance structure/objectives will determine models, which will determine data needs

But

- Data will determine ability to implement models, which provide the information that policies are based on

Data, Modeling & Data Management Requirements

Data

- Known large monitoring gaps for fishery management (commercial cost data, PR, habitat, regional models, sociocultural)
- EAF & EAM: data needs will be broader in scope, finer in scale
  - Institutional barriers on commercial side not only result in high cost inefficiencies, preclude the ability to have economic data on actual activity, which results in poor temporal and spatial resolution
- Data requirements will change as the pieces fall into place; the data acquisition plan will become a living document.

Data, Modeling & Data Management Requirements

Modeling: see State of the Art for insights on requirements

Some observations

- Models play a role in determining data requirements;
- Models play a role in determining research requirements
- Models support management structures

Data, Modeling & Data Management Requirements

Data Management Plan

- Critical function: information & computational burden much greater under EAF/M so payoffs from technological gains in efficiencies much higher
- Inventory: potential ability of being able to identify low cost investments that greatly enhance utility of existing data

Governance Structure

EAF / EAM discussion

- Information and modeling needs of each regime differ
- Benefit of EAM is that it would provide more policy options to management (Le Chatelier Principle)
- May be an issue of incremental realization (or not)
- Improved information under either approach should result in a reduction of large management mistakes (guard against introducing new sources of errors)
- EAF encompassed in EAM: benefits & costs not internal to EAF decision making process may be discounted
- Governance structures need authority

Governance Structure

Some observations:

- Governance structures need authority: match governance structure to objectives and desired outcomes
- Resources need to be managed to preclude irreversible damages.